# MONOLITHIC SEMICONDUCTOR-PIEZOELECTRIC DEVICE STRUCTURES AND ELECTRO-ACOUSTIC CHARGE TRANSPORT DEVICES

## Abstract of the Disclosure

An epitaxial layer of crystalline piezoelectric material such as lithium niobate and lithium tantalate can be grown overlying a silicon wafer by first growing an intermediate strain-relief layer on the silicon wafer. Early in the growth of the piezoelectric layer, the strain-relief layer is a crystalline metal oxide, which helps bridge the lattice mismatch between silicon and the piezoelectric material. After growth of a thin crystalline piezoelectric layer, the strain-relief layer is amorphized to decouple the silicon and piezoelectric crystal lattices. Growth of the piezoelectric layer may then be resumed to obtain a good quality thicker layer suitable for electro-acoustic device fabrication. Passive and active electro-acoustic devices may be fabricated using the epitaxial piezoelectric layer. In particular, acoustic charge transport devices that utilize device elements in both silicon and the piezoelectric epitaxial overlayer are designed and fabricated. The electro-acoustic devices may be integrated with semiconductor device circuitry fabricated on the silicon wafer.